

of wing, and this short band is more confined to vicinity of crossveins, and does not spread backwards to base of wing.

Length about 6 mm.

Mr A. E. Wright found this species on 23rd and 24th July 1944 on the leaves of *Solidago virgaurea* in a wood near his home. He caught three females (two of which he has generously given to me), and saw three other specimens which dropped down into the herbage beneath the plant and could not be found. The larvae of *Spilographa* are leaf-miners, therefore one might naturally suspect that the three females caught on *Solidago* were there for the purpose of oviposition, but unfortunately this has not, so far, been proved. A search by Mr Wright in 1945 failed to supply either larvae or additional imagos. The birch and hazel undergrowth in the wood had grown up and overshadowed the herbage and *Solidago* plants, and the flies appeared to have deserted the original locality, nor could any specimens be found by diligent searching and sweeping in the vicinity, moreover the search was repeatedly hampered by unfavourable meteorological conditions. There is no doubt that Mr Wright's pertinacity in such matters will sooner or later be rewarded, and the question in connection with the food-plant of this species answered.

THE GEOGRAPHICAL DISTRIBUTION OF CERTAIN HEBRIDEAN INSECTS AND DEDUCTIONS TO BE MADE FROM IT.

By J. W. HESLOP-HARRISON, D.Sc., F.R.S.

As is well known, for a long period of years, expeditions, organised by the Department of Botany, King's College (University of Durham), have been studying the flora and fauna of the Inner and Outer Hebrides. During the course of these investigations, we have encountered forms, belonging to many groups of plants and animals, displaying marked peculiarities in distribution, which naturally invited speculation as to their causes. Obviously, these problems and their solution depended directly upon changes in the Quaternary geography of the islands. Thus we were compelled to study not only the present biogeography of the Hebrides, but also that of their past.* This does not seem an appropriate time to discuss our work in the latter direction, nor to deal with all animal and plant groups; it is proposed to confine attention to the distributions of a very limited number of Hebridean insects, and to set out the more important deductions made from them in the light of recognized biogeographical principles.

But, before doing so, it will be well, perhaps, to supply Braun-Blanquet's admirable and concise exposition of biogeographical methods as provided in the *Annales de la Société Linnéenne de Lyon* (1922, Vol. 68, page 140). There he writes: "L'une, géographique, part de la distribution actuelle des organismes et de leurs groupements naturels. Elle étudie leurs conditions de vie, leur capacité d'accommodation, leur faculté d'expansion. Retracer les voies de migration, esquisser aussi exactement que possible les liens géographiques, discerner les centres de dispersion, voilà le but auquel tendent les efforts."

Amongst the insects we have encountered lending themselves to such

work and methods, none stand out more significantly than the Lepidoptera, *Nyssia zonaria*, *Euphydryas aurinia*, *Zygaena purpuralis* and *Z. filipendulae*, and the Hymenoptera, *Bombus smithianus*, *B. jonellus* var. *hebridensis* and *B. muscorum* var. *pallidus*. Of these *Nyssia zonaria*, an insect possessing an apterous female, deserves special attention for it occurs throughout the "Long Island" from Lewis in the north to the Barra Isles in the south, in Coll, Gunna and Tiree, and in Muck, Eigg, Rhum and Canna. Further, *Bombus smithianus* and a number of plants have a similar range.

Clearly, these groups of islands harmonize in their zoogeographical affinities as determined by these insects as indicators. Moreover, these insects are absent from the Scottish mainland, and from the Isles of Skye, Rona, Raasay, Scalpay, Mull, Colonsay, Islay and Jura, in all of which *B. smithianus* is replaced by its ally *B. muscorum* var. *pallidus* of mainland proclivities. From these facts, several conclusions can be drawn: (1) That the Outer Isles, the Coll-Tiree group and the Rhum-Eigg-Canna series have undergone a long-continued separation from the mainland; (2) that they have been linked up amongst themselves during that severance; and (3) that when the Isles of Skye, Mull, Raasay, Rona, Scalpay, Colonsay, Islay and Jura received their *Bombus* population they were united to, or within easy access of, the mainland and, notwithstanding the proximity of some of the isles supporting *B. smithianus*, not approachable from them.

Again, *Bombus jonellus* var. *hebridensis* is restricted to, and endemic in, the Outer Isles. This points to a considerable lapse of time during which the Outer Isles and Inner Isles remained separate, whilst the insect was evolved and dispersed.

Furthermore, the concentration of the American group of plants in the Isle of Coll suggests a connection between Coll, Tiree and Gunna on the one hand, and Ireland on the other, long after all three had parted from the Outer Hebrides; this view is supported by the occurrence of the Irish Burnet (*Zygaena purpuralis*) in Gunna, and of the Irish form of the Greasy Fritillary (*Euphydryas aurinia* var. *praeclara*) in Tiree and Gunna. In addition, for similar and other reasons, Rhum and Eigg come into the same picture.

Taking cognizance of many observations of these types and their implications, we have made what we considered legitimate deductions about the distribution of Hebridean organisms and their history and geography. For instance, when an insect, obviously of anomalous distribution, has been detected on one or more islands appertaining to groups related zoogeographically, we have regarded the fact as indicating the possibility of the same insect's (or its allies') presence on other islands of the series. It will suffice, of the many available, to quote two such published forecasts. In the *Entomologist* (LXXV, p. 36), on the basis of the capture of *Notodonta ziczac* in Harris and South Uist, the possibility of its occurrence on Benbecula, North Uist, is put forward. In the same way (*Ent. Record*, December 1940, p. 137), after references to the Rhum, Eigg and Gunna colonies of *Zygaena purpuralis*, it is urged that the Irish Burnet might reasonably be expected to turn up on "Muck, Canna and the southern members of the Outer Island chain."

To the latter pronouncement, for reasons best known to himself,

Mr J. L. Campbell seems to have strong objections, and, after a previous tilt in the *Entomologist* for November 1944 (p. 175) he returns to the subject in the current (December) number (p. 188) of the same magazine. There we are informed that predictions, made on principles regarded as sound by all zoogeographers, are "without scientific value and lacking in courtesy to fellow entomologists." This cannot be allowed to pass.

In the first place, Mr Campbell asserts that I stated that he only recorded *Zygaena filipendulae* from one locality (Ben Erival) in Barra; my statement is absolutely true. He manages to make up his alleged five localities by including the separate Isles of Hellisay, Flodday, Pabbay and Orosay, one of which, Pabbay, is $5\frac{1}{2}$ miles from Barra. Again, he claims that he recorded the Six-spot Burnet as "widespread but local and not very common" in Barra. This, likewise, fails to agree with the facts; of his five habitats, only one is on Barra, the remaining four being in other islands, and, secondly, the insect is very common on the Isle of Barra itself, and on Fuday, Fiaray, Muldoanich, Vatersay, Uinessan, Sandray, Pabbay and on the second Flodday lying west of Sandray. Then he recounts that the Isle of Barra was well searched for Lepidoptera in 1935, 1936 and 1937 by himself, the University of Edinburgh Biological Society and Mr R. B. Freeman. In a letter to me (3/3/41), he writes that he made a very careful examination of Barra in 1936 and 1937, and those details he repeats in his *Scottish Naturalist* paper (November-December 1938, p. 137). Here, it will be observed, there is no reference to his searches for Lepidoptera in 1935 nor to the "several years" of his 1944 note. Further, he fails to mention that the Edinburgh Biological Society record no *Zygaena* from Barra, and only *Z. loniceræ* (erroneously) from Hellisay and Orosay. In connection with the latter records, Mr Campbell adds further mystification; in some extraordinary way only one specimen seems to have been involved!

This then is the sorry picture which Mr Campbell adorns with the optimistic description of "exhaustive and thorough work."

A dispassionate examination of the real facts will show that, in view of Campbell's sketchy examination of Barra, which led to almost negligible results, there is no necessity for me to withdraw or modify in the slightest my prediction concerning *Z. purpuralis* and the southern members of the Outer Island chain. As far as Canna is concerned, Mr Campbell has attended to that; his unwarranted transplantation of Rhum examples of *Z. purpuralis* to Canna has effectually vitiated any future zoogeographical work with the insect on the latter island. Concerning this peculiar episode, and his "experiments" with the food-plants of the insect, our friend maintains a very discreet silence.

One more reference to Mr Campbell's note will suffice. He makes a pitiful attempt to father on me a view that Wreck Bay and the Sgorr Reidh on Rhum are the same in order to consolidate the position that he has discovered a new station for the Irish Burnet on Rhum. On no occasion have I stated that they were the same. My original note (*Ent. Record*, December 1940, p. 137) gives the *purpuralis* locality as "North-West of Harris along the cliffs." The total distance involved in this is less than three miles, of which the Sgorr Reidh guards the landward side of Wreck Bay.

Despite Mr Campbell, the known geographical distributions of *Zygaena purpuralis* and *Z. filipendulae* remains of enormous importance to the student of Hebridean zoogeography, the first-named as indicating ancient land connections between Rhum, Eigg and the Coll group and with Ireland, and the latter in affording evidence that there has existed a period, possibly post-glacial, when migrating organisms had free access from the mainland to the whole of a Hebridean area, now represented by both the Inner and the Outer Isles.

ON DRAWING CONCLUSIONS.

BY AN OLD MOTH-HUNTER.

"Life," wrote Samuel Butler, "is the art of drawing sufficient conclusions from insufficient premises." Bionomics, on the other hand, at least so far as insects are concerned, ought to be the art of drawing *possible* conclusions from abundant premises. Where moths are concerned "you never can tell," and the wise Lepidopterist prefers "possible" to "probable" even when dealing with cast-iron evidence.

On 27th July, two years ago, while searching birch on a hillside near my war-time abode, I found, on the underside of a leaf, a black hemispherical eggshell which reminded me so strongly of *Cerura hermelina*, Göze (*bifida*, Hub.) that I sent it to South Kensington for identification. The great expert who examined it considered that my guess at *C. bicuspis* was not unduly optimistic, *pabulo intuyente*. Yet although I devoted the two succeeding winters—or at least such parts of them as were free, for an hour or two, from rain, or on which I was not afflicted with laziness—to a scrutiny of every birch where this eggshell occurred, nary a cocoon could I find. Not even an empty one. I read and re-read the instructions of Dr Chapman (who found *bicuspis* in quantity in Herefordshire) and the Reverend Miles Moss (who was equally successful in Norfolk), and I carried an aged mackintosh whereon I could sit down beside likely trees and examine the trunks with the eyes of a woodpecker. To no avail.

A fortnight ago—it was in the first week of April—I chanced to examine trunks of alders in a meadow-bottom below the hill, a quarter of a mile from the site of my eggshell, and on one of them I found an aged cocoon that was plainly Cerurid. The only other trees within a radius of forty yards were oaks, a hawthorn, and, some ten or twelve yards away, a willow. But a bog separated the willow from the alders, a bog which, in September, becomes a very wet bog indeed; and to jump from tuft to tuft across this water-logged swamp would, I was convinced, try the constitution of any "Kitten" severely. Without doubt this old cocoon and my eggshell had a common origin—*Cerura bicuspis*, Bork.

Still, I was not *quite* satisfied. The cocoon did not answer to the descriptions of a *bicuspis* cocoon given in the textbooks, where it is said to resemble a Brazil nut. It wasn't in the least like a Brazil nut. It wasn't like any kind of nut at all. It resembled nothing so much as a cocoon of *C. furcula*, L. So I sent it, as I had done with my eggshell, to Mr Tams, and he too was doubtful. . . . But, said I to myself,